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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/181,809	10/29/1998	TSUTOMU ISHII	101327	1313

25944 7590 03/12/2004

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EXAMINER	
CHU, KIM KWOK	
ART UNIT	**PAPER NUMBER**
2653	33

DATE MAILED: 03/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/181,809	ISHII ET AL.	
	Examiner	Art Unit	
	Kim-Kwok CHU	2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Reconsideration filed on 2/12/04*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Remarks

1. Applicant's Remarks filed on February 23, 2004 (paper 32) has been fully considered.

(a) Applicant states that the prior art of Michl does not teach "a spatial optical modulator that controllably rotates a polarization angle of said recording light" (page 1 of the Request for Reconsideration; last 4 and 3 lines). Accordingly, a spatial optical modulator is an inherent device for recording data on a birefringence material because the spatial modulator is used to modify the recording beam's polarization angle based on the input data. The modulated recording beam then induces the birefringence of the recording material to achieve multilevel recording.

(b) Since the prior art of Michl does not disclose the inherent spatial optical modulator, a newly found reference of Savant is used as a prior art in this Office Action.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> *A person shall be entitled to a patent unless --*
> *(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.*

3. Claims 30-34 are rejected under 35 U.S.C. § 102(b) as being anticipated by Savant et al. (U.S. Patent 5,384,221).

Savant teaches an optical recording apparatus having all of the elements and means as recited in claims 30-34. For example, Savant teaches the following:

(a) as in claim 30, a light source 10 that generates recording light (Fig. 3);

(b) as in claim 30, a spatial optical modulator 12 that controllably rotates a polarization angle of the recording light (Fig. 3; column 24, lines 66 and 67);

(c) as in claim 30, a focusing optical system 16 that performs multilevel modulation of an azimuth of an optical recording layer within an optical medium 18 by directing the recording light obtained through the spatial optical modulator 12 to an optical recording medium (Fig. 3; column 7, 7-18; multilevel modulation can be considered as storage of many more bits on a given spot as taught);

(d) as in claim 31, the spatial optical modulator 12 controls a polarization angle of the recording light in response to recording information 14 (Figs. 3);

(e) as in claim 32, the spatial optical modulator 12 is a polarization rotary device (Fig. 3);

(f) as in claim 33, a medium driving mechanism that rotates the optical recording medium (Fig. 3; medium driving mechanism is the spin motor);

(g) as in claim 33, a head moving mechanism that moves an optical head that includes the light source, the spatial optical modulator and the focusing optical system (Fig. 3; inherent features to read/write information recorded on the medium); and

(h) as in claim 34, an optical recording medium 18 (Fig. 3).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> *(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.*

5. Claims 1-29 and 35-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leube et al. (U.S. Patent 5,251,197) in view of Savant et al. (U.S. Patent 5,384,221) and Michl et al. (U.S. Patent 4,551,819).

Leube teaches an optical recording medium very similar to the instant invention. For example, Leube teaches the following:

(a) as in claim 1, the optical recording medium comprises at least one optical recording layer 12 (Fig. 1);

(b) as in claim 1, the optical recording layer 12 including an optical recording material that changes a state of photo induced birefringence in response to a recording light 14 (Fig. 1);

(c) as in claim 1, a substrate which sustains the optical recording layer, wherein recorded information can be reproduced

from the optical recording medium (Fig. 1; substrate is an inherent feature of an optical recording medium);

(d) as in claim 2, the recording layer 2 has a refractive index expresses in variables of wavelength and thickness as $\Delta n * d = (m + 1/2) * \lambda$ (inherent feature of a half-wave plate as illustrated in equations 2 and 5 on pages 6 and 9 of the specification respectively);

(e) as in claim 3, the photo-induced birefringence is caused by a refractive index change (inherent feature of the anisotropic material which induces birefringence);

(f) as in claims 4, 5, 7, 8 and 57, the recording layer 12 comprises a liquid crystal polymer (azobenzene) comprises a side chain that includes a group which is photoisomerized (Fig. 1; column 2, line 51; azobenzene is a photoisomerized material);

(g) as in claims 6 and 9, the polymer comprises at least one kind of monomer-polymer azobenzene (inherent feature because monomer azobenzene is a required material for forming photoisomerization) and

(h) as in claims 10, the optical layer 2 has a disk shape recording medium (Fig. 1).

However, Leube does not teach the following:

(a) as in claim 1, the recording light is externally controlled from the optical recording medium to rotate a

polarization angle of the recording light;

(b) as in claim 1, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a half-wave plate (phase difference between o and e is 180 degree); and

(c) as in claim 1, an azimuth of the half-wave plate within the optical recording medium is multilevel-modulated so that information is recorded on the optical recording medium by the recording light.

Savant teaches a recording method having the following:

(a) the polarization angle of a light beam generated from a laser source is externally rotated by a polarizer 12 (Fig. 3).

Michl teaches a recording method having the following:

(a) the recording layer which acts as a half wave plate (column 10, lines 61-64); and

(b) an azimuth of the half-wave plate within the optical recording medium is multilevel-modulated so that information is recorded on the optical recording medium by the recording light (abstract, lines 10 and 11; column 15, lines 1-29).

A light beam generated from a laser source does not include any data to be recorded. The recording data is added to the light beam by a modulator which is used to change the polarization angle of the light beam based on the recording

data. Hence, when there is a need to change the birefringence of Leube's recording layer 12, it would have been obvious to one of ordinary skill in the art to use a spatial optical modulator such as Savant's, because the modulator changes the light beam's polarization angle for inducing birefringence recording in the recording layer.

On the other hand, although Leube does not specify that his birefringence recording layer acts as a half-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a half-wave plate which causes the ordinary and extraordinary rays of Leube's light beam having a phase difference of one half of the wavelength of the light beam.

Furthermore, to increase the storage capacity and to take advantage of the polarized light to modulate a writing beam, it would have been obvious to one of ordinary skill in the art to use Michl's polarizer so that the light beam of Leube in view of Savant can be multi-modulated to record multi-level data.

6. Claims 11-20 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. Claim 11 however also recites the following limitation which is also taught by Savant:

(a) as in claim 11, an optical reflection layer formed on one surface of the optical recording layer.

Savant teaches the following:

(a) an optical reflection layer formed on one surface of the optical recording layer 18 (Fig. 3; the incident light beam is reflected back to the detector 26).

The reflection layer is an inherent feature of an optical recording medium such as Savant's, because it is needed to reflect the light beam back as a reproducing light beam for data detection.

7. Claims 21 and 58 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. Claim 21 however also recites the following limitation which is also taught by Michl:

(a) as in claim 21, the optical recording medium acts as a quarter-wave plate.

Michl teaches the following:

(a) the media having the property of birefringence can either act as a quarter-wave or a half-wave plate (Fig. 7; column 13, lines 37-40; column 14, lines 49-54).

Although Leube does not specify that his birefringence recording layer acts as quarter-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a quarter-wave plate which causes the ordinary and extraordinary rays of Leube's light beam having a phase difference of one quarter of the wavelength of the light beam.

8. Method claims 22-25 are drawn to the method of using the corresponding apparatus claimed in claims 1 and 6. Therefore method claims 22-25 correspond to apparatus claims 1 and 6 and are rejected for the same reasons of obviousness as used above. In addition, Leube also teaches the following limitations:

(a) as in claim 24, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needs to be rotated in order to access the recorded information); and

(b) as in claim 24, radiating the recording light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the recording light needs to be radiated along the diameter direction of the medium in order to record information); and

(c) as in claim 25, the optical element is formed in a position at least partially coextensive with an existing optical element in the optical recording medium (Fig. 1; half-wave plate is formed on the recording layer under the light beam).

9. Claims 26-29 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. Claim 26 however also recites the following limitation which is also taught by Michl:

(a) as in claim 26, the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can either act as a quarter-wave plate (Fig. 7; column 13, lines 37-40; column 14, lines 49-54).

Although Leube does not specify that his birefringence recording layer acts as a quarter-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a quarter-wave plate which causes the ordinary and extraordinary rays of Leube's light beam having a phase difference of one quarter of the wavelength of the light beam.

10. Claims 35, 36 and 59 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 35, the recording material stores multilevel (zero and 1) information (inherent feature).

11. Claims 37, 38 and 60 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. Claim 37 however also recites the following limitation which is also taught by Michl:

(a) as in claim 37, the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can either act as a quarter-wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54).

Although Leube does not specify that his birefringence recording layer acts as a quarter-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a quarter-wave plate which causes the ordinary and extraordinary rays of Leube's

light beam having a phase difference of one quarter of the wavelength of the light beam.

12. Claims 39 and 61 have limitations similar to those treated in the above rejection, and are met by the references as discussed above.

13. Method claims 40-42 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claims 40-42 correspond to apparatus claim 1 and are rejected for the same reasons of obviousness as used above.

In addition, Leube also teaches the following limitations:

(a) as in claim 41, the reproducing light has a light intensity smaller than that of the recording light (Fig. 1; reproducing/reading light has less intensity than the recording light because recording requires energy such as heat to write on the recording layer);

(b) as in claim 42, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needs to be rotated in order to access the recorded information); and

(c) as in claim 42, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needs to be radiated along the diameter direction of the medium in order to

access the recorded information).

14. Method claims 43-45 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claims 43-45 correspond to apparatus claim 1 and are rejected for the same reasons of obviousness as used above. In addition, Leube also teaches the following limitations:

(a) as in claim 43, the recording material stores multilevel (zero and 1) information (inherent feature);

(b) as in claim 44, the reproducing light has a light intensity smaller than that of the recording light (Fig. 1; reproducing/reading light has less intensity than the recording light because recording requires energy such as heat to write on the recording layer);

(c) as in claim 45, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needs to be rotated in order to access the recorded information); and

(d) as in claim 45, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needs to be radiated along the diameter direction of the medium in order to access the recorded information).

Claim 43 however also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave

plate.

Michl teaches that the media having the property of birefringence can either act as a quarter-wave or a half-wave plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54).

Although Leube does not specify that his birefringence recording layer acts as a quarter-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a quarter-wave plate which causes the ordinary and extraordinary rays of Leube's light beam having a phase difference of one quarter of the wavelength of the light beam.

15. Claims 46-48 have limitations similar to those treated in the above rejection, and are met by the references as discussed above. In addition, Leube also teaches the following limitations:

(a) as in claim 46, an analyzing unit 20 that detects a polarization angle of reproducing light transmitted by the optical element (Fig. 1);

(b) as in claim 47, rotating the optical recording medium (Fig. 1; inherent feature because the recording medium needs to be rotated in order to access the recorded information);

(c) as in claim 47, radiating the reproducing light along a diameter direction of the optical recording medium (Fig. 1; inherent feature because the reproducing light needs to be radiated along the diameter direction of the medium in order to access the recorded information); and

(d) as in claim 48, the optical recording medium 12 (Fig. 1).

16. Method claims 49-51 are drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claims 49-51 correspond to apparatus claim 1 and are rejected for the same reasons of anticipation (obviousness) as used above. In addition, Leube teaches the following:

(a) as in claim 50, an analyzing unit 20 that detects a polarization angle of reproducing light transmitted by the optical element (Fig. 1);

(b) as in claim 51, an optical recording medium;

(c) as in claim 50, a medium driving mechanism that rotates the optical recording medium (Fig. 1; medium driving mechanism is an inherent feature because the recording medium needs to be rotated); and

(d) as in claim 50, a head moving mechanism that moves an optical head that includes the light source 14, the spatial optical modulator 24 and the focusing optical system (Fig. 1; optical head is moved in order to causes various birefringence spots on the recording medium similar to writing bits on the track).

Claim 50 however also recites the following limitations:

(a) the optical recording medium acts as a quarter-wave plate.

Michl teaches that the media having the property of birefringence can either act as a quarter-wave or a half-wave

plate (Fig. 7; column 13, lines 37-41; column 14, lines 49-54).

Although Leube does not specify that his birefringence recording layer acts as a quarter-wave plate, for inducing phase difference on a polarized light beam such as Leube's, it would have been obvious to one of ordinary skill in the art at the time of invention to replace Leube's birefringence recording layer with Michl's birefringence recording layer, because Michl's recording layer acts like a quarter-wave plate which causes the ordinary and extraordinary rays of Leube's light beam having a phase difference of one quarter of the wavelength of the light beam.

17. Claim 52 has limitations similar to those treated in the above rejection, and is met by the references as discussed above. In addition, Michl also teaches the following limitations:

(a) as in claim 52, a focusing optical element that irradiates an optical recording medium 24 with reproducing light (Fig. 9 illustrated a focused laser light source).

Furthermore, Leube also teaches the following:

(b) as in claim 52, an analyzing unit 20 that detects a polarization angle of reproducing light acted on by the optical recording medium (Fig. 1).

18. Method claim 53 is drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 53 corresponds to apparatus claim 1 and is rejected for the same reasons of obviousness as used above.

In addition, Leube teaches the following:

(a) as in claim 53, forming an optical element on the optical recording medium by the illumination having an azimuth corresponding to a polarization angle on the optical recording medium (Fig. 1; optical elements which induce birefringence are formed in the recording layer).

19. Claim 54, 55 and 56 has limitations similar to those treated in the above rejection, and are met by the references as discussed above.

In addition, Leube teaches the following:

(a) as in claim 54 forming an optical element on the optical recording medium by the illumination having an azimuth corresponding to a polarization angle on the optical recording medium (Fig. 1; optical elements which induce birefringence are formed in the recording layer);

(b) as in claim 55, the optical element acts on reproducing light to adjust a polarization angle of the reproducing light (Fig. 1; the reflected/reproducing light is rotated by induced birefringence).

(c) as in claim 55, adjust a polarization angle of the reproducing light by an amount greater than a difference between a polarization angle of the recording light and a reproducing light (Fig. 1; inherent feature because the reflected light is being rotated furthermore by the induced birefringence) and

(d) as in claims 53 and 54, determining a polarization angle of reproducing light acted on by the optical element (Fig. 1; detector 20 detects polarization angle).

20. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks Washington, D.C. 20231 Or faxed to:

(703) 872-9306 (for formal communications intended for entry. Or:

(703) 746-6909, (for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2021 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-4700.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kim CHU whose telephone number is (703) 305-3032 between 9:30 am to 6:00 pm, Monday to Friday.

Kim-Kwok CHU 2/23/04

TAN DINH
PRIMARY EXAMINER

Examiner AU2653
February 23, 2004
(703) 305-3032